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## Incidence of Neural Tube Defects in Al-Yarmouk Teaching Hospital Over One Year (2006-2007)

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### **Abstract:**

**Background:** The neural tube defects (NTDs) are still one of the commonest serious malformations in the world, and a major cause of still birth and infant deaths.

**Aim of the study:** To estimate the incidence of neural tube defects (NTDs) and to identify some of the possible risk factors for their occurrence.

**Patients and method:** Across-sectional study was carried out in the maternity ward at Al-Yarmouk teaching hospital in Baghdad. All live and still births delivered over a one year period from March 2006 to March 2007 were included and assessed for the presence of NTDs. The demographic characteristics and general information of all the neonates and their mothers were collected by direct interview of mothers using special questionnaire form.

**Result:** the incidence of NTDs was 10.7/ 1000 total birth, while it was 7.4/ 1000 live births and 242.4/1000 still births. Spina bifida was the most common type of NTDs observed among the affected cases 15 (60%). Mother's age, parity, resided in rural area and positive family history of NTDs all these factors showed statistical significant association with the occurrence of NTDs, in addition the results revealed the incidence of NTDs was 14.8/ 1000 births among neonates born to mothers not received folic acid supplementation during pregnancy.

**Key words:** Incidence, NTDs.

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### **Introduction:**

The neural tube defects (NTDs) are still one of the commonest serious malformation in the world, and a major cause of still birth and infant deaths<sup>[1]</sup>.

The prevalence of NTDs at birth varies considerably by country, geographic zone, and ethnic and racial group; it ranges from as high as 1 case in 100 births in some regions of China to about 1 case in 2000 or less in some Scandinavian countries. In many countries the prevalence is approximately 1 in 1000 births<sup>[2,3]</sup>.

The NTDs present as wide spectrum of abnormalities from anencephalus which is incompatible with survival, to cases of complicated Spina bifida occulta<sup>[1]</sup>.

The existing studies suggest that both genetic and environmental risk factors are associated with the occurrence of NTDs<sup>[4]</sup>. Some NTDs have been associated with chromosomal abnormalities (trisomy 18, 13 and 21) and some single gene defects such as Meckel- Gruber syndrome<sup>[5]</sup>. NTDs are usually sporadic events, but studies on families showed that the chance of having a second family member born with NTD after one child is born with NTD increase,

the estimates for recurrence risk range from 3-5% depending on the population risk<sup>[4,6]</sup>.

It believed, however that the most common types of NTDs are multifactorial in origin; this occurs when there is a genetic predisposition to the malformation which is triggered by an environmental risk factor<sup>[7]</sup>. A number of risk factors have been associated with NTDs including: low socio economic status, lead in drinking water, maternal heat exposure, maternal obesity, type 1 diabetes mellitus, use of valproic acid and carbamezapine during pregnancy, in addition to nutritional and vitamins deficiencies, one of the most important is folic acid, which is an important substrate for normal early neural tube development<sup>[8,9,10,11,12,13]</sup>.

Neural tube defect shows female predominance, as females accounting for 60-70% of affected children<sup>[4]</sup>. The present study was carried out aiming to estimate the incidence of NTDs and to identify some of the possible risk factors for their occurrence.

**Patients & Method:**

This descriptive cross-sectional study was carried out in the maternity ward at Al- Yarmok teaching hospital in Baghdad. All live and still birth newborns delivered in the hospital, over the 1-year period from March 2006 to March 2007 were included in the study and were assessed for the presence of NTDs.

Demographic characteristics and general information of the neonates and their mothers: sex presence of NTDs and its type, mother's age, parity, residence, of NTDs, family history of NTDs and history of folic acid intake during the current pregnancy were collected by direct inter viewing of mothers using special questionnaire form. All data were analyzed and were evaluated and compared with the chi-square test. A P- value of 0.05 or less was considered statistically significant.

**Results:**

The total number of deliveries over the period of the study was 2324. Of these 2291 live births and 33 stillbirths, with 25 newborns and still births were diagnosed with NTDs, giving an incidence of 10.75

per 1000 total births, while it was 7.4/ 1000 live births and 242.4/ 1000 still births. There were 10 males and 15 females; the rate of NTD was 10.3/1000 and 11/1000 in males and females respectively (no significant difference) table 1.

Out of the 25 NTD cases, 15 (60%) had Spina bifida, 6 (24%) were anencephalic and 4 (16%) had encephalocele. When reviewing the maternal history of mothers with affected babies, 6 (24%) had reported the recurrence of NTD in their babies.

Table-2 shows the rate of NTDs by mother's age; the highest rate of NTD was 37.7 per 1000 births with mother's age  $\geq 35$  years. 17 mothers were multigravida; 8 mothers were primigravida (P= 0.012). The NTD rates were 24.1/1000 birth and 7.49/1000 birth for mothers resided in rural and urban areas respectively (P=0.002). The rate of NTD was 166.6/1000 births for neonates with positive family history of NTDs (P=0.0001). Out of the total mothers included in the study, the majority 1280 (55%) were not received folic acid supplementation during pregnancy, giving an incidence of NTDs of 14.8/1000 births, (P=0.03).

**Table-1 Incidence of neural tube defects (per 1000 births) by type of birth and sex**

Variable	Total no. of birth	NTD cases		X <sup>2</sup>	P-value
		No.	/1000		
Live birth	2291	17	7.42	168.83	0.0001
Still birth	33	8	242.4		
Total birth	2324	25	10.75		
<b>Sex</b>					
Male	970	10	10.30	0.03	0.859
Female	1354	15	11.07		

**Table-2 Incidence of neural tube defects (per 1000 births) according to some maternal characteristics**

Variable	Total no. of birth	NDT cases		X <sup>2</sup>	P-value
		No.	/1000		
<b>Mother's age (years)</b>					
15-	119	4	33.61	12.06	0.017
20-	1080	9	8.33		
25-	988	8	8.09		
30-	84	2	23.80		
35 and over	53	2	37.73		
<b>Gravidity</b>					
Multigravida	1988	17	8.55	6.29	0.012
Primigravida	336	8	23.80		
<b>Residence</b>					
Urban	1868	14	7.49	9.52	0.002
Rural	456	11	24.12		
<b>Family history</b>					
Yes	30	5	166.66	69.42	0.0001
No	2294	20	8.71		
<b>Folic acid Supplementation</b>					
Yes	1044	6	5.74	4.47	0.035
No	1280	19	14.84		

**Discussion:**

In this study, the incidence of NTDs was 10.75/1000 births, which is higher compared to other countries such as United Kingdom (0.5/1000 live births)<sup>[14]</sup>, Turkey (30.1/10000 births)<sup>[15]</sup>, Iran (28.7 / 10000 live births)<sup>[16]</sup> and Jordan (6.5 / 10000 live births)<sup>[17]</sup>. These variations in different studies could be explained by the influence of racial, ethnic and social factors in various parts of the world, which are commonly explained as genetic disorders.

Geographical, nutritional, socioeconomic and biological factors could also be involved. Other reason for these variations in NTDs rates is the quality of antenatal care provided to women during pregnancy such as early fetal ultrasound to detect congenital abnormalities, as the detection of seriously abnormal fetus offers the opportunity for the parents to consider terminating the pregnancy which lead to falling in incidence of NTDs.

Spina bifida was the most common NTD in this study, which agrees with other studies<sup>[16, 17]</sup>. Regarding sex differences, the present result indicate that the rate of NTD showed no significant differences between males and females, this finding was similar to a study in Iran<sup>[16]</sup>. This research

showed that the highest rate of affected newborns was in mothers aged  $\geq 35$ , followed by mothers aged 15-19 years. Our observation was also reported by other researchers<sup>[18, 19]</sup>; a U-shaped curve with higher rates in mothers aged under 20 years and over 35year. Thus age is complex risk factor in NTDs.

A greater incidence of NTDs at birth has been shown for rural areas compared with urban areas. Other studies also revealed the same findings<sup>[16, 18]</sup>. It may be due to the effects of environmental factors such as exposure to toxic agricultural substances and nutritional factors such as folate deficiency.

This study showed a significant association between family history of NTDs and NTDs occurrence, a similar observation was also reported by other studies<sup>[4, 6]</sup>. This indicates that genetic factor could be a risk factor for NTDs occurrence.

It is now known that folic acid is an important substrate for normal early neural tube development, this finding was documented in previous studies<sup>[17, 20]</sup>, in this study the NTD rate was higher among babies born to mothers had not received folic acid supplementation during pregnancy.

Given the high incidence of NTDs found in this study, measures are needed to reduce this rate in

our country. Folate should be given to all mothers intending to become pregnant and efforts should be directed to educate them about its importance. In addition, medical practitioners delivering antenatal care should take steps to minimize the occurrence of NTDs and at the same time increase early diagnosis to allow parents other options.

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